

ALBERTY et al  
Appl. No. 10/565,625  
April 7, 2008

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**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-18 (cancelled).

19 (currently amended). A method of reducing formation breakdown during the drilling of a wellbore which method comprises:

(a) circulating a drilling mud in the wellbore comprising (i) an aqueous or oil based fluid, (ii) at least one fluid loss additive at a concentration effective to achieve a high temperature high pressure (HTHP) fluid loss from the drilling mud of less than 2 ml/30 minutes wherein the HTHP fluid loss is determined using an HTHP test according to the specification of the American Petroleum Institute (API), ~~as described in API Recommended Practice 13B-2 Third Edition, February 1998, Section 5.2.1 to 5.2.3 or Recommended Practice 13B-1 Second Edition, September 1997, Section 5.3.1 to 5.3.2~~ that employs a pressurized cell fitted with a filtration medium comprising a standard hardened filter paper having a filtration area of 3.5 square inches ( $2.258 \times 10^{-3} \text{ m}^2$ ) wherein the drilling mud is filtered using the cell at a temperature corresponding to the temperature in the wellbore and with a standard pressure differential across the filter paper of 500 psi (3.45 MPa) and wherein a filter cake is allowed to build up on the filter paper for a period of 30 minutes, and the volume of filtrate collected after this 30 minute period is doubled to give a corrected American Petroleum Institute (API) fluid loss value, and (iii) a solid particulate bridging material having an average particle diameter of 25 to

ALBERTY et al  
Appl. No. 10/565,825  
April 7, 2008

2000 microns and a concentration of at least 0.5 pounds per barrel (1.43 kg/m<sup>3</sup>);

(b) increasing the pressure in the wellbore to above the initial fracture pressure of the formation such that fractures are induced in the formation and a substantially fluid impermeable bridge comprising the solid particulate bridging material and the fluid loss additive(s) is formed at or near the mouth of the fractures thereby strengthening the formation;

(c) thereafter continuing to drill the wellbore with the pressure in the wellbore maintained at above the initial fracture pressure of the formation and below the breakdown pressure of the strengthened formation.

20 (currently amended). A method as claimed in ~~Claim~~ claim 19 wherein the pressure in the wellbore in step (c) is maintained at least 300 psi (2.07 M Pa) above the initial fracture pressure of the formation and below the breakdown pressure of the strengthened formation.

21 (currently amended). A method as claimed in ~~Claims~~ claim 19 or 20 wherein the solid particulate bridging material is added to a circulating drilling mud having an HTHP fluid loss value of less than 2 ml/30 minutes prior to increasing the pressure in the wellbore to above the initial fracture pressure of the formation.

22 (currently amended). A method as claimed in ~~Claims~~ claim 19 or 20 wherein the strengthened formation is a depleted formation.

ALBERTY et al  
Appl. No. 10/565,625  
April 7, 2008

23 (currently amended). A method as claimed in ~~Claims~~ claim 19 or 20 wherein the strengthened formation is a weak formation in a previously drilled section of wellbore.

24 (currently amended). A method as claimed in ~~Claims~~ claim 19 or 20 wherein the drilling mud has a HTHP fluid loss value of less than 1 ml/30 minutes, preferably less than 0.5 ml/30 minutes.

25 (currently amended). A method as claimed in ~~claims~~ claim 19 or 20 wherein the concentration of solid particulate bridging material in the circulating drilling mud is at least 10 lb per barrel (26.6 kg/m<sup>3</sup>), preferably at least 15 lb per barrel (42.9 kg/m<sup>3</sup>).

26 (currently amended). A method as claimed in ~~Claims~~ claim 19 or 20 wherein the drilling mud is recycled to the wellbore after separating material having a size of greater than 500 microns therefrom using a 35 mesh screen (US sieve series).

27 (currently amended). A method as claimed in ~~Claim~~ claim 26 wherein fresh solid particulate bridging material is added to the drilling mud prior to recycling the drilling mud to the wellbore.

28 (currently amended). A method as claimed in ~~Claim~~ claim 19 wherein the drilling mud is recycled to the wellbore after separating drill cuttings from the drilling mud using a centrifuge or hydrocyclone.

ALBERTY et al  
Appl. No. 10/565,625  
April 7, 2008

29 (currently amended). A method as claimed in Claim claim 23 wherein a pill of the drilling mud having a concentration of solid particulate bridging material of at least 50 lb per barrel ( $143 \text{ kg/m}^3$ ) is circulated to the weak formation and is squeezed into the weak formation with the pressure in the wellbore in the vicinity of the weak formation maintained at above the initial fracture pressure of the weak formation.

30 (previously presented). A drilling mud composition comprising (a) an aqueous or oil based fluid; (b) at least one fluid loss additive at a concentration effective to achieve a high temperature high pressure (HTHP) fluid loss from the drilling mud of less than 2 ml/30 minutes wherein the HTHP fluid loss is determined using an HTHP test according to the specification of the American Petroleum Institute (API), ~~as described in API Recommended Practice 13B-2 Third Edition, February 1998, Section 5.2.1 to 5.2.3 or Recommended Practice 13B-1 Second Edition, September 1997, Section 5.3.1 to 5.3.2~~ that employs a pressurized cell fitted with a filtration medium comprising a standard hardened filter paper having a filtration area of 3.5 square inches ( $2.258 \times 10^{-3} \text{ m}^2$ ) wherein the drilling mud is filtered using the cell at a temperature corresponding to the temperature in the wellbore and with a standard pressure differential across the filter paper of 500 psi (3.45 MPa) and wherein a filter cake is allowed to build up on the filter paper for a period of 30 minutes, and the volume of filtrate collected after this 30 minute period is doubled to give a corrected American Petroleum Institute (API) fluid loss value; and (c) a solid particulate bridging material having an average particle diameter in the range 50 to 1500 microns and a concentration of at least 0.5 pounds per barrel (1.43

ALBERTY et al  
Appl. No. 10/565,625  
April 7, 2008

kg/m<sup>3</sup>).

31 (currently amended). A drilling mud composition as claimed in ~~Claim~~ claim 30 having a specific gravity in the range 0.9 to 2.5.

32 (currently amended). A drilling mud composition as claimed in ~~Claims~~ claim 30 or 31 wherein the solid particulate bridging material comprises at least one substantially crush resistant particulate solid selected from the group consisting of graphite, calcium carbonate (~~preferably marble~~), dolomite, celluloses, micas, sand and ceramic particles.

33 (currently amended). A drilling mud composition as claimed in ~~Claim~~ claim 30 wherein the concentration of the solid particulate bridging material is at least 10 pounds per barrel (28.6 kg/m<sup>3</sup>), ~~preferably at least 15 pounds per barrel (42.9 kg/m<sup>3</sup>)~~.

34 (currently amended). A drilling mud composition as claimed in ~~Claim~~ claim 30 wherein the solid particulate bridging material has an average particle diameter in the range 250 to 1000 microns.

35 (currently amended). A drilling mud composition as claimed in ~~Claim~~ claim 30 having an HTHP fluid loss value of less than 1 ml/30 minutes, ~~preferably less than 0.5 ml/30 minutes~~.

ALBERTY et al  
Appl. No. 10/565,625  
April 7, 2008

36 (currently amended). A drilling mud composition as claimed in ~~Claim~~ claim 30 wherein the fluid loss additive(s) is selected from organic polymers of natural or synthetic origin and finely dispersed clays.

37 (new). A method as claimed in claim 24 wherein the drilling mud has a HTHP fluid loss value of less than 0.5 ml/30 minutes.

38 (new). A method as claimed in claim 25 wherein the concentration of solid particulate bridging material in the circulating drilling mud is at least 10 lb per barrel ( $26.6\text{kg/m}^3$ ).

39 (new). A drilling mud composition as claimed in claim 32 wherein the solid particulate bridging material comprises marble.

40 (new). A drilling mud composition as claimed in claim 33 wherein the concentration of the solid particulate bridging material is at least 15 pounds per barrel ( $42.9\text{ kg/m}^3$ ).

41 (new). A drilling mud composition as claimed in claim 35 having an HTHP fluid loss value of less than 0.5 ml/30 minutes.

42 (new). A method according to claim 19 wherein the test temperature is in the range of 50 to  $150^\circ\text{C}$ .

ALBERTY et al  
Appl. No. 10/565,625  
April 7, 2008

43(new). A method according to claim 30 wherein the test temperature is in the range of 50 to 150°C.